DESCRIPTION

MEDICINE PACKING APPARATUS

Technical Field

[0001] The present invention relates to a medicine packing apparatus.

Background Art

[0002] Conventionally, as a medicine packing apparatus, there has been an apparatus which is provided with two printer heads for printing the medicine packing sheet with patient name, medicine name, usage and so on; between which a detection roller rotatable due to contact with the packing sheet and an encoder for detecting a feed quantity of the packing sheet from the rotation quantity of the detection roller are provided so that the printer heads are operated based on the detection result of the encoder to print the packing sheet (for example, Japanese patent No. 2579010).

[0003] However, in the medicine packing apparatus, only the feed quantity of the packing sheet is detected. Therefore, there has been a disadvantage that if the packing sheet has a slack between the printer heads and a heat-seal portion at the downstream side of the printer heads when starting the print, the dimension between the print position and the heat-seal position can not be held to be a predetermined value, disenabling to print at a desired position.

Disclosure of Invention

[0004] So, it is an object of the present invention to provide a medicine packing apparatus enabling to print the packing sheet accurately at the desired position.

[0005] The present invention provide a medicine packing apparatus in which a packing sheet is printed with predetermined information by printing means, medicine is fed into the packing sheet by medicine feed means, and the packing sheet is sealed by seal means to pack the medicine by one package, wherein:

the seal means is provided with conveyance portion for conveying the packing sheet;

in the middle of a conveyance path from the print means to the seal means, there are provided moving means which comes into contact with the packing sheet and moves so that the tension of the packing sheet is held to be a constant value, and

position detecting means which detects a moved position of the moving means;

whereby after the packing sheet is conveyed by the conveyance portion and the position detecting means detects a predetermined moved position, print by the print means is started.

[0006] In the above constitution, a dimension between a moved position of the moving means, i.e. a contact position with the packing sheet and a print position by the print means can be made a predetermined value, preventing a shift of sealing position.

[0007] The moving means may comprise a roller which is rotatable and movable and urging means which urges the packing sheet with a constant force to eliminate a slack of the packing sheet.

[0008] It is preferable that the roller is a tension roller attached on a descending and ascending table which descends and ascends along a guide rail, the tension roller forcing up the packing sheet, and that the urging means is a spring for urging the descending and ascending table in an upward direction.

[0009] It is also preferable that the position detecting means detects a descending position of the descending and ascending table.

[0010] Further, the present invention provide a medicine packing apparatus in which a packing sheet is printed with predetermined information by printing means, medicine is fed into the packing sheet by medicine feed means, and the packing sheet is sealed by seal means to pack the medicine by one package, wherein:

the seal means is provided with conveyance portion for conveying the packing sheet;

in the middle of a conveyance path from the print means to the seal means, there is provided tension detecting means which detects a tension act on the packing sheet;

whereby after the packing sheet is conveyed by the conveyance portion and tension detecting means detects a predetermined tension of the packing sheet, print by the print means is started.

[0011] In the above constitution, the print by the print means can be started in a condition that a constant tension acts on the packing sheet and no slack exists, enabling to seal at a constant position with respect to the print position.

[0012] According to the present invention, after the detected tension becomes a predetermined value, print by the print means can be started, allowing the positional relationship between the conveying position and the print position to be accurately held to a constant value, enabling to correctly print at the desired position.

Brief Description of Drawings

[0013] Fig. 1 is a perspective view of a medicine packing apparatus according to an embodiment of the present invention;

Fig. 2 is a perspective view showing a print unit and a packing unit of Fig. 1;

Fig. 3 is a front view of the print unit of Fig.2;

Fig. 4 is a partly enlarged front view of Fig. 3;

Fig. 5 is an enlarged left side view of Fig. 4;

Fig. 6 is an enlarged view in the vicinity of a tension roller of Fig. 5;

Fig. 7(a) is a plane view of the packing unit of Fig. 1 and 7(b) is a front view thereof;

Fig. 8 is a schematic illustrative explanatory view showing a conveying path of the packing sheet;

Fig. 9 is a partly front view of the packing unit; and

Fig. 10(a) is a partly enlarged view in the vicinity of a connection portion between a feed heat-seal portion and a vertical heat-seal portion of the embodiment of the present invention and 10(b) is a partly enlarged view in the vicinity of a connection portion between a feed heat-seal portion and a vertical heat-seal portion of a conventional heater roller.

Best Mode for Carrying Out the Invention

[0014] Hereinafter, embodiments according to the present invention will be described in accordance with the accompanying drawings.

[0015] Fig. 1 shows a medicine packing apparatus according to the embodiment of the present invention. The medicine packing apparatus is provided with a tablet feed portion 2 as the medicine feed means of the present invention and a powder feed portion 3 on the upper side of an apparatus body 1 and provided with a print unit (print means) 5 and a packing unit 8 on the lower side thereof.

[0016] The tablet feed portion 2 is so constructed that when tablets to be packed into one package are previously manually put in each box formed like a lattice, a bottom plate of each box is sequentially opened to feed the tablets to the packing unit 8.

[0017] The powder feed portion 3 is so constructed that when powder is poured

through a hopper 3, the powder is fed in an outer annular groove of a distribution dish not shown and the powder to be packed into one package is scraped out by a powder scraping apparatus not shown to feed the powder to the packing unit 8.

[0018] The print unit 5 is so constructed that as shown in Figs. 2 to 4 a packing sheet 7 wound on a roll 6 is rewound and printed with patient name, medicine name, usage and so on and then conveyed to the packing unit 8. The packing sheet 7 is turned to a horizontal direction by a guide portion 9 and then ink of an ink ribbon 11 is thermal transferred to the upper surface of the packing sheet 7 by means of a thermal transfer potion (printer head) 10. The printed packing sheet 7 passes through a tension roller 12 and is turned upward by means of a first roller 13. Then, the packing sheet 7 is guided by a guide piece 14 to move upward and then turned obliquely downward by means of a second roller 15 to advance toward the packing unit 8.

[0019] The ink ribbon 11, as shown in Fig. 3 and 4, is wound on a first roll 16 and continuously rewound to a second roll 17. Each of the rolls 16, 17 is cylindrical and inner cylinders 16a, 17a are supported on holding plates 19 which are fixed on both ends of four guide shafts 18 disposed around the rolls to constitute an ink cartridge 20. On the end of an arm portion 21 extending from the lower guide shaft 18 is rotatably attached an auxiliary roller 22.

[0020] The ink cartridge 20 is attached on a side plate 23 by fitting the inner cylinders 16a, 17a of the rolls 16, 17 on shaft portions 24a, 24b protruding from the side plate 23 and then screwing nuts or so on the ends of shaft portions 24a, 24b. Driving a motor (ink ribbon conveying portion) not shown to rotate the shaft portion 24b allows the ink ribbon 11 wound on the first roll 16 to be rewound on the second roll 17. The ink ribbon 11 is positioned between the thermal transfer portion 10 and the

guide portion 9 and the slack of the ink ribbon 11 is removed by an urged roller 25. The urged roller 25 is rotatably attached on the end of an arm member 26 rotatably provided around a support shaft 26a. The arm member 26 is urged in a clockwise direction in Fig. 4 by a spring 27 one end of which is engaged with a attachment piece 43 attached on the apparatus body 1.

[0021] The tension roller 12 (moving means of the present invention), as shown in Figs. 5 and 6, is attached on the support portion 29 extending from a descending and ascending table 28. The descending and ascending table 28 is provided with a cover 30 for forming a path, through which the packing sheet 7 passes, above the tension roller 12. The descending and ascending table 28 is provided so as to descend and ascend along guide rails 31 uprightly provided at predetermined distance and is urged upward by a spring 32. A descending position of the descending and ascending table 28 is specified by detecting a magnet 44 built in the descending and ascending table 28 by means of a sensor 33 (position detecting means of the present invention) disposed aside. In order to make it possible to easily insert the packing sheet 7, the descending and ascending table 28 is positioned at a lowest position by engaging an engagement recess portion 28a with a engagement piece 45 comprising a leaf spring attached on the side plate 23.

[0022] The packing unit 8 is so constructed that the packing sheet 7 printed by the print unit 5 is folded into two or previously has been folded into two; the packing sheet 7 is sealed in a longitudinal direction at predetermined intervals by means of a seal portion 34 that is a sealing means of the present invention to form a bag portion; the medicine fed from the tablet feed portion 2 or the powder feed portion 3 is introduced into the bag formed; and remaining one side of the packing sheet 7 is sealed.

[0023] The seal portion 34 is attached in an oblique state corresponding to the

packing sheet 7 that advances obliquely downward. In the seal portion 34, as shown in Fig. 7, a pair of feed rollers 39 is intermittently driven via a directly driven gear 38a and a intermittently driven gear 38b by means of a motor 37 provided on the rear surface side of the side plate 23 of the apparatus body 1. Thus, the packing sheet 7 sandwiched between the feed rollers 39 is intermittently conveyed.

[0024] Referring further to Fig. 9, on the upstream side of the feed rollers 39 with respect to the feed direction of the packing sheet 7, there are disposed a pair of heater rollers 41, 42 and a restriction plate 50 for delivering the packing sheet 7 to the heater rollers 41, 42 in a V-shaped opened state. Each of the heater rollers 41, 42 is provided with a feed heat-seal portion 51 of circular plate and a vertical heat-seal portion 52 of thin rectangular plate on lower end of which a roller portion 55 having same diameter as that of the feed heat-seal portion 51 is integrally formed. The feed heat-seal portions 51, 51 are driven to rotate via gears 40a, 40b and so on by the motor 37 described above. In this embodiment, as the motor 37, a stepping motor is used so that change of pulse of the applied voltage allows conveying quantity to be adjusted. Between the heat-seal portions 51, 51 of the both heater rollers 41, 42, both side edges of the packing sheet 7 are sealed. The vertical heat-seal portions 52 are driven to rotate by means of a rotation drive mechanism separately from the feed heat-seal portions 51, 51 (but, the rotation axes of the feed heat-seal portion 51 and the vertical heat-seal portion 52 are coincide with each other). The vertical heat-seal portions 52 are provided with a pair of heat-seal surfaces 52a opposite to each other. Since the vertical heat-seal portions 52 of both heater rollers 41, 42 are driven separately from the feed heat-seal portions 51, 51, the seal distance along the conveying direction of the packing sheet 7 formed by the heat-seal surfaces 52a can be freely set.

[0025] Referring Fig. 10(a), construction in the vicinity of the upper end of the

vertical heat-seal portion 52 will be explained. On the feed heat-seal portion 51 and the vertical heat-seal portion 52, small grooves 53 extending in a feed direction of the packing sheet 7 are formed at relatively narrow distances. At the heat seal surface 52a in the vicinity of the upper end of the vertical heat-seal portion 52 is formed a diameter enlarging portion 52b which extends in an arc-like shape outwardly toward the feed heat-seal portion 51. Further, between the diameter enlarging portion 52b and the end surface of the feed heat-seal portion 51 is formed a heat-seal introducing portion 54 of circular plate having a thin thickness. Referring to Fig. 10(b), in this kind of conventional heat rollers 41', 42', the diameter enlarging portion 52b' of the heat seal surface 52a' of the vertical heat-seal portion 52' has come into direct contact with the end surface of the feed heat-seal portion 51'. In such construction of Fig. 10(b), tension force act on the packing sheet 7 in the vicinity of the contact portion of the feed heat-seal portion 51' and the vertical heat-seal portion 52' becomes non-uniform, which causes the packing sheet 7 to shift with respect to the feed heat-seal portion 51' and the vertical heat-seal portion 52', resulting in wrinkle in the packing sheet 7 after completion of seal. On the other hand, in the present invention, as the heat-seal introducing portion 54 of circular plate is formed between the diameter enlarging portion 52b and the end surface of the feed heat-seal portion 51 is formed as shown in Fig. 10(1), tension force act on the packing sheet 7 in the vicinity of the contact portion of the feed heat-seal portion 51 and the vertical heat-seal portion 52 becomes uniform, which allows the packing sheet to be smoothly introduced between the heater rollers 41, 42, enabling to prevent the generation of aforementioned wrinkle.

[0026] Operation of the aforementioned medicine packing apparatus will be described.

[0027] Before starting the packing process, a slack of the packing sheet 7 may exist

between the heater rollers 41, 42 of the packing unit 8 and the thermal transfer portion 10 of the print unit 5. This slack is eliminated by the urged tension roller 12 moving upward as shown in two-dots chain line in Fig. 8. in this case, the distance between the seal portion 34 and the thermal transfer portion 19 varies in accordance with the quantity of eliminated slack.

[0028] So, the feed roller 39 is driven to rotate first, allowing the packing sheet to be conveyed. Thus, tension act on the packing sheet 7 is increased, causing the tension roller 12 to descend against the urging force of the spring 32. When the sensor 33 (see Fig. 6) detects that the tension roller 12 descends until the descending position, the thermal transfer portion is heated to start print of the packing sheet 7. Thus, the packing sheet 7 can be printed as the tension act on the packing sheet 7 is constant, allowing the dimension between the seal portion 34 and the thermal transfer portion 10 to be held at a predetermined value.

[0029] Subsequently, when the packing sheet 7 with predetermined print is conveyed to the packing unit 8, the heater rollers 41, 42 are rotated so that the packing sheet 7 folded into two is sealed to make bags. Then, medicine are fed from the tablet feed portion 2 or the powder feed portion 3 in accordance with a prescription data and introduced into the packing sheet 7 via the packing hopper 35. After that, rotation of the heater rollers 41, 42 is continued so that the remaining part of the packing sheet 7 is sealed to complete the packing of medicine to be packed into one package.

[0030] As described above, according to the medicine packing apparatus, when starting the packing process, print is surely commenced after descending the tension roller 12 and detecting the descending position thereof by means of the sensor 33. Therefore, tension force act on the packing sheet 7 becomes constant, allowing the dimension between the seal portion 34 and the thermal transfer portion 10 to be

accurately held to a constant value, enabling to correctly print at the desired position.

[0031] In the aforementioned embodiments, although the tension roller 12 is constituted so as to descend and ascend and the position thereof is detected so that the position thereof can be detected so that the dimension between the print position and the seal position of the packing sheet 7 can be held to a predetermined value, it is also allowable that, for example, tension detecting means for detecting tension act on the packing sheet 7 is provided and print by the thermal transfer portion 10 is commenced after the tension detected by the tension detection means becomes a predetermined value. As the tension detecting means, an arm or the like that comes into contact with the packing sheet 7 and changes its rotation angel inn accordance with the difference of the tension of the packing sheet 7 would be given but the constitution thereof would not be limited.